

Issued June 22, 1914.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS—MILTON WHITNEY, Chief.
IN COOPERATION WITH THE WEST VIRGINIA GEOLOGICAL SURVEY
I. C. WHITE, STATE GEOLOGIST.

SOIL SURVEY OF KANAWHA COUNTY,
WEST VIRGINIA.

BY

W. J. LATIMER AND M. W. BECK.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1912.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1914.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., November 8, 1913.

SIR: Under the cooperative agreement with the West Virginia Geological Survey, I. C. White, State Geologist, a soil survey of Kanawha County was carried to completion during the field season of 1912.

I have the honor to transmit herewith the manuscript and map covering this work and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1912, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

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Soil map, Kanawha County sheet, West Virginia.

SOIL SURVEY OF KANAWHA COUNTY, WEST VIRGINIA.

By W. J. LATIMER and M. W. BECK.

DESCRIPTION OF THE AREA.

Kanawha County is situated in the south-central part of West Virginia. It is bounded on the north by Jackson and Roane, on the east by Clay and Fayette, on the south by Raleigh and Boone, and on

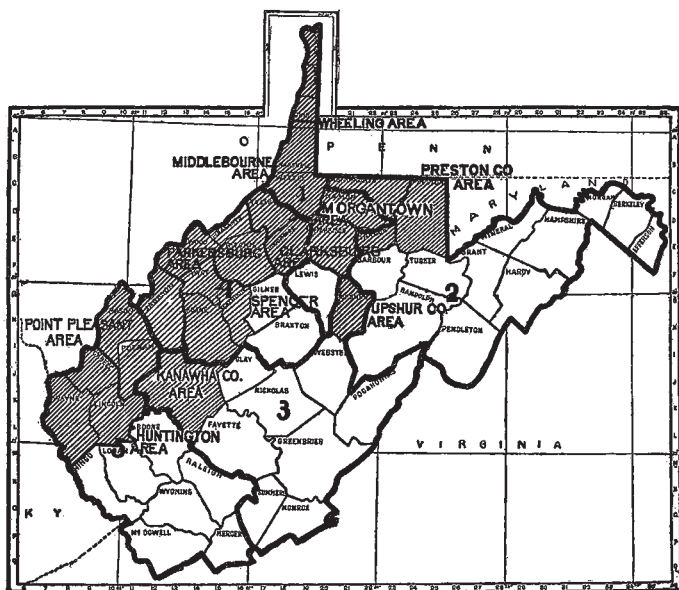


FIG. 1.—Sketch map showing areas surveyed in West Virginia.

the west by Lincoln and Putnam Counties. It has an area of 914 square miles, or 584,960 acres.

Physiographically the county lies wholly within the Appalachian Plateau. The original plateau has been severely dissected by erosion until the entire county is cut into narrow, deep, V-shaped valleys and narrow hogback ridges. The general level of the ridges ranges from 400 to 600 feet above stream level in the western part of the county to 1,000 to 1,200 feet above stream level in the eastern part. The range of elevation above sea is from 600 feet along the Kanawha

River to 2,800 feet in the extreme southern part of the county. The hills over the western half of the county are more rounded and the valley walls more gently sloping than in the southeastern half, where the comparatively narrow ridge tops are supported by the massive Mahoning sandstone and the valley walls are very steep and the valleys very narrow.

The Kanawha River flows in a general northwesterly direction through the center of the county. This stream has a valley about a mile wide at the western edge, narrowing to about three-fourths of a mile at the eastern edge. The Elk River flows in a general southwesterly direction and joins the Kanawha River at Charleston. The valley proper of this stream is about one-half mile wide throughout its course in the county. The regional drainage is performed by these streams and their tributaries. Old river channels form a marked feature of the topography of the county. The "Flatwoods" near the Putnam County line represents the largest of these developments.

Most of the northwestern part of the county is cleared and in farms, while a large proportion of the southeastern half is still in forest, although most of it is cut-over land.

The early settlements in what is now Kanawha County were made about 1780 to 1790. Settlers, mainly from Virginia and North Carolina, came into the section in large numbers during the first decade following 1800. The farming element of the county has descended from the original settlers. The more recent immigration has been caused by the growth of lumbering and coal mining. The development of the coal and oil fields in particular has brought large numbers of immigrants from the adjoining States to the north and west. Kanawha County is now one of the most densely populated counties in the State.

The development of the coal fields has increased rapidly during the last 10 years and at the present time a large percentage of the population of the county is engaged in this industry. Besides the extensive coal veins, the county is abundantly supplied with building stone and clay deposits. These have been developed to a very small extent. At one time the Kanawha salt fields produced considerable salt, but all except one of these have long been abandoned.

The Blue Creek oil field, to the northeast of Charleston, has been developed during the past year and gives employment to a large number of people. The development of gas has been sufficient to give Charleston a very low gas rate.

Kanawha County is well supplied with transportation facilities. It is traversed by the main line of the Chesapeake & Ohio Railroad, which gives connections to the east, west, and southwest. Branches of this road penetrate the coal fields. The Kanawha & Michigan gives an

outlet to the northwest and the Coal & Coke Railroad to the north. Other small roads act as feeders for these main lines. Charleston is connected with St. Albans, on the south side of the river, and with Dunbar, on the north side, by trolley lines. The Kanawha River is locked and dammed through its entire course in the county and to the Ohio River, and affords a means for water transportation.

Public roads along the larger stream valleys are fairly good and a few other roads connecting the city of Charleston with other centers are kept in good condition during most of the year. Several of the old pikes constructed before the days of railroads are still in use. In general, however, the roads need improving, though, considering the broken topography of the country and the character of the road material, they are not far below the average country thoroughfares.

Charleston, the capital of the State, with a population of 22,996, is located at the confluence of the Kanawha and Elk Rivers, near the center of the county, and affords a good market for produce and for securing supplies for the entire county. St. Albans, with 1,209 inhabitants, and Clendenin, with 815, are other important towns.

CLIMATE.

Kanawha County has neither the rigorous winters of the North nor the intense heat that is experienced in the South during the summer, but rather a mild, equable, and healthful climate, well suited to general farming, fruit growing, and stock raising.

The mean annual temperature is 57.5°F. , the winter mean is 39.0°F. , and the summer mean 74.6°F. The highest recorded temperature in summer is 104°F. and the lowest in winter is -11°F. , but even such extremes are rare and of very short duration. In summer the nights are usually cool and there is little suffering from the heat. The climatic conditions prevailing during the spring and fall months are almost ideal.

The mean annual precipitation of 43.21 inches is well distributed throughout the year, the greatest amount occurring during the growing season. Heavy floods usually come in the early spring before crops are planted or before it is too late to replant. Damaging floods in late summer and fall are almost unknown. The snowfall is usually light and remains upon the ground for comparatively short periods. Droughts during the fall months are not uncommon. The growing season covers a period of about six months. Grazing lasts for about eight or nine months.

In the following table is given the normal monthly, seasonal, and annual temperature and precipitation and the occurrence of killing frosts in the spring and fall as recorded at Charleston.

Normal monthly, seasonal, and annual temperature and precipitation at Charleston.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	41.2	70	2	3.19	2.73	4.45	2.9
January.....	38.9	77	2	3.47	1.68	3.82	4.2
February.....	36.9	71	-11	3.66	2.63	6.98	7.6
Winter.....	39.0			10.32	7.04	15.25	14.7
March.....	51.7	87	18	4.42	3.54	8.90	5.5
April.....	55.4	90	23	3.57	4.08	4.41	0.4
May.....	66.3	92	31	4.06	2.72	7.55	0.0
Spring.....	57.8			12.05	10.34	20.86	5.9
June.....	72.3	93	40	4.59	2.69	3.19	0.0
July.....	76.2	100	51	3.82	3.28	3.28	0.0
August.....	75.3	104	50	4.26	3.45	8.87	0.0
Summer.....	74.6			12.67	9.42	15.34	0.0
September.....	70.8	100	33	2.72	1.51	3.63	0.0
October.....	57.6	96	20	2.49	1.65	3.28	Trace.
November.....	47.6	80	17	2.96	0.45	1.84	0.7
Fall.....	58.7			8.17	3.61	8.75	0.7
Year.....	57.5	104	-11	43.21	30.41	60.20	21.3

Average date of first killing frost in fall, Oct. 19; of last in spring, Apr. 24. Earliest date of killing frost in fall, Oct. 3; latest date of killing frost in spring, May 10.

AGRICULTURE.

Until within the last decade the agriculture of Kanawha County was confined to general farming and stock raising, but since then trucking and dairying have become important industries, especially in the vicinity of Charleston and St. Albans. At the present time the county may be divided into five sections, in accordance with the predominant type of agriculture.

In the eastern part of the county, around St. Albans, Coal River, and the "Flatwoods," where the Meigs soils form the upland and large areas of Holston soils are found, general farming is practiced with tobacco forming the main money crop. Very few truck crops are grown, and only a fair number of cattle are kept. Commercial fertilizers, some manure, leguminous crops, and to a limited extent cover crops turned under are depended upon to keep up the productivity of the soil. Fruit is grown to a very small extent.

In the country around Sissonville, or the Pocatalico country, and extending across the northern part of the county, the cattle industry

is extensively developed, and large areas are in bluegrass pastures. Hay is produced to some extent. No truck or tobacco is grown. Very little fertilizer is used, some stable manure is applied to the fields, a relatively small acreage is devoted to clover, and cover crops here and there turned under. In this section a practice is made of feeding cattle upon ground where hay is cut, thus returning to the soil the fertilizing elements of the crops.

In the country surrounding Charleston and upon the Kanawha River bottoms the principal forms of agriculture are truck growing and dairying. Some general farming is done, and some fruit is grown upon the ridges. The truck crops grown are potatoes, tomatoes, cabbage, cauliflower, kale, turnips, spinach, radishes, squash, cucumbers, beans, peas, sweet corn, lettuce, onions, beets, strawberries, cantaloupes, and watermelons. Fertilizers and stable manure hauled from Charleston are depended upon to maintain the productiveness of the soil.

In the country southeast of Charleston and north of the Kanawha River from Marmet to Montgomery agriculture is not very highly developed. Some general farming is practiced, and fruit and truck crops are grown to a limited extent. A few cattle and sheep are kept.

The country south of the Kanawha River and east of Lens Creek may be classed as a nonagricultural district, only widely scattered patches of corn and garden vegetables being found.

Where general farming is practiced the principal crops are corn, wheat, oats, clover, and timothy. The minor crops are sorghum, cowpeas, soy beans, redtop, millet, and Irish and sweet potatoes.

Very little improved labor-saving machinery is used except upon the river terraces and bottom lands. Fertilizers are used to a limited extent except by the tobacco growers and truckers.

There are some large commercial apple orchards in the county, and nearly every farm has an orchard to supply home needs and some surplus for sale. The fruit in general is of excellent color and quality, and the trees seem to bear well. The favored varieties are: Fallawater, Ben Davis, Rome Beauty, York Imperial, Baldwin, Winesap, Jonathan, and Rambo. Peaches, cherries, pears, and plums are produced in a small way.

Tobacco growing was introduced into the county from the Teays Valley; in fact, the tobacco-growing section of the county is really a portion of the Teays Valley tobacco district. Bright Burley (Lockwoods) is the variety grown. Most of the tobacco produced is of high grade. The leaf is bright and pliable and has splendid wrapping qualities. It is used largely for plug wrappers and for the manufacture of cigarette and pipe smoking tobacco. The quality of leaf varies considerably with the soil type, the condition of the land, and the quantity of manure and kind of fertilizer used. The first-bottom overflow lands

produce heavy yields of tobacco of a good grade. The terrace soils produce an excellent grade of leaf, but the yield is somewhat less than on the first bottoms. The quality of hill-land tobacco varies with the condition of the fields. In some instances the quality is good, especially on newly broken land, which is very often used for this crop. The yields are not as heavy as on the bottom and terrace soils.

Corn has been grown in steadily increasing quantities since the early settlement of the county. Its production is confined largely to the river terraces and first-bottom land. In the southeastern part of the county it is grown to some extent on the hillsides, but the yields are usually low, except upon new land. Boon County White, Reeds Yellow Dent, and Hickory King are the varieties most commonly grown. At the present time corn is planted on a larger acreage than any other of the tilled crops. Fertilizers are not used in growing corn upon the bottom-land soils, and only in small quantities where this crop is planted in the uplands. Manure is used when it can be obtained.

Wheat is grown to a very limited extent, usually upon terrace soils or flat ridge tops.

Irish potatoes are generally grown for home consumption. A few growers, located in the Kanawha Valley and upon the low hills around Charleston, produce this crop on a commercial scale. Sweet potatoes of fair quality are produced to some extent upon the bottom-land soils in all parts of the county.

The grasses used in the county for the production of hay are timothy, redtop, millet, and crab grass. Hay is produced in comparatively small quantities, but large areas of bluegrass are used as pasture.

Sorghum is grown to some extent on the bottom land. It makes a good grade of sirup.

Alfalfa has been successfully grown upon comparatively small areas of well-drained, well-aerated river-terrace land. The majority of the upland soils are too shallow for the production of the crop. The Upshur clay contains enough lime, but the compact impervious nature of the subsoil almost precludes the profitable production of alfalfa.¹ However, clovers, soy beans, cowpeas, and vetch are legumes more or less adapted to most of the soil types in the county.

A large number of cattle are raised in the county the principal breeds being Herefords, Hereford grades, and scrub stock. Most of them are shipped out when 2 or 3 years old. The few sheep kept are of the mutton variety. Hogs are found on nearly every farm. The majority of the animals are of the Berkshire and Poland-China breeds, with some Chester Whites.

A rotation of crops followed where hay is the important crop consists of winter wheat, then clover and timothy, cut for hay until timothy begins to run out, and then corn. If pasture is desired bluegrass

¹ See Farmers' Bulletin 339, on Alfalfa.

instead of timothy is sown with the clover. In the tobacco districts wheat generally follows tobacco after the latter has been grown for two or three years in succession. More often than otherwise grass and clover seed are sown with wheat, but if a shorter rotation is desired, clover alone is sown, and the sod turned and the land put in corn the next year. No definite rotation is followed upon the overflow lands, and in some places corn has been planted continuously for many years.

According to the Thirteenth Census, there are 2,669 farms in Kanawha County, with an average size of 66.3 acres. Of the entire number of farms 70.1 per cent are operated by the owners and 29.3 per cent by tenants. The tenants paying cash rent are somewhat in excess of those farming on shares. Where the payment of cash rent is stipulated the rate varies considerably, being governed by location, condition of the land, etc. On the basis of shares the owner usually receives one-half the crop. In the case of tobacco he receives one-third of the crop on the bottom soils and one-fourth on upland and terrace soils.

Farm laborers are scarce, a great many men having been attracted by other industries or trades where the price paid for labor is higher. Most of the work on the farm is done by farmers and their families. The average price paid for farm labor is \$1 a day.

SOILS.

Exclusive of Riverwash, 14 soil types and 1 type phase were mapped in Kanawha County. These fall into three general groups, viz, upland, or residual; terrace, or old alluvial; and recent first-bottom alluvial.

The soils are grouped into series, the types in which have similar origin, color, structure, and drainage, the individual types being distinguished by differences in texture—that is, differences in the proportions of soil particles of various sizes which compose the soil.

The following outline gives the soil groups and classification according to origin and process of formation:

Group.	Material from which derived.	Name.
Upland or residual.	Fine-grained sandstone and gray shale.	Dekalb silt loam.
	Fine and coarse grained sandstones and shales, sandstone predominating.	Dekalb stony silt loam.
	Red and green shales, more or less calcareous, and fossiliferous limestone.	Upshur clay.
	Red and gray shales and sandstones.....	Meigs clay loam.
	Hard, massive sandstone.....	Rough stony land.
Terrace or old alluvial.	Old terrace or Teays formation.	All are derived from material washed from Dekalb soils.
	More recent low terrace.	
		{ Holston sandy loam. Holston silt loam. Holston silt loam, low-terrace phase. Holston fine sandy loam.

Group.	Material from which derived.	Name.
First bottom or recent alluvial.	Derived from material washed from Dekalb and Meigs soils. Subject to poor drainage conditions.	Holly silty clay loam.
	Wash from Dekalb and Meigs soils and Rough stony land, drainage well established	Huntington silt loam. Huntington loam. Huntington fine sandy loam. Huntington sandy loam.
	Wash from Upshur clay and Meigs clay loam . . .	Moshannon silt loam.

The geological formations outcropping in the county and entering into the composition of the upland soil and subsequently influencing indirectly the character of the alluvial soils are the Monongahela, Conemaugh, Allegheny, and Pottsville formations of the Upper Carboniferous era.

The Monongahela and Conemaugh formations, consisting of alternate layers of sandstone and red shale, interbedded with a few thin strata of gray shale, limestone, sandstone, and coal seams, outcrop over the northern and western parts of the county, covering it entirely above drainage, and give rise to the Upshur and Meigs soils. The Mahoning sandstone, which is at the base of these formations, outcrops along a general northeast and southwest line through the county, entering near Alum Creek, passing near Charleston, and following the general course of Elk River. As the Mahoning sandstone rises to the east of the Warfield anticline, the Meigs soils cap the hills, but the "red" shales play out near the crest of this anticline, and the Conemaugh formation, found capping the hills in the southern part of the county, gives rise to Dekalb silt loam. The formations below and including the Mahoning sandstone give rise to Dekalb soils, the flattened ridge tops and more gently sloping portions to the silt loam, and the hill-sides and steeper portions to the stony silt loam.

The red shale formations are thicker in the northeastern part of the county, as evidenced by the predominance of Upshur material, and are also more calcareous. The red shale formations seem to thin toward the southeast and the sandstone to thicken, until the southern part of the county is reached, where a section would show almost entirely sandstone interbedded with thin, gray shale, sandstone, and coal seams.

In the Cabin Creek and Paint Creek region the Dekalb stony silt loam is steeper than in other sections and includes larger areas of Rough stony land than are found in other parts of the county or in other regions where this type has been mapped.

The Dekalb silt loam is more extensively developed in this county than in any other part of West Virginia so far surveyed. It occurs in large areas upon the crests of ridges in the southeastern part of the county. The type contains more stone and the topography is in

general rougher than is characteristic of this soil in the other areas surveyed in the State.

Rough stony land is not extensively developed in the county, considering the generally rough, broken topography found here. It occupies only steep cliffs and rocky promontories along valley fronts.

The Upshur clay is less extensively developed than in the counties to the north, but more so than in those to the southwest. The Meigs clay loam is fairly typical.

The Holston silt loam represents old alluvium laid down when the streams of this section were flowing at a much higher level than they are at the present time and when some of them followed channels in places widely separated from their present courses. This old alluvial formation has suffered by erosion to the extent that very little of the original deposit is left. The low-terrace phase of the type is of somewhat more recent deposition, lying as second bottom along streams flowing approximately in the channels they occupy at present. The Holston fine sandy loam is developed as sandy prominences on the low terraces.

The first-bottom soils have been classified in the Huntington, Moshannon, and Holly series. The Huntington silt loam and the Moshannon silt loam are fairly typical of these types as mapped in adjoining counties. The Huntington loam and fine sandy loam represent high bottom land subject only occasionally to overflow, and a portion of the fine sandy loam probably lies above overflow. Both types are higher above stream level than the same types mapped in adjoining counties. The Huntington sandy loam being derived from material washed from the Dekalb soils and Rough stony land varies considerably in composition. In places it includes considerable Riverwash.

The Holly silty clay loam is found almost exclusively in the swales and poorly drained areas of the Kanawha River bottom. The type is very much like the Tyler soils, and some of it lies nearly high enough to be classed as Tyler. It is subject to occasional overflow and receives a fair amount of seepage water from the adjoining hill land.

Riverwash is a classification used for the broad stream beds in the southern part of the county, where the deposits of soil have been removed during high water. It is developed to a very small extent. This is the first time that areas of this character of sufficient size to be mapped have been found in West Virginia.

The following table gives the names and extent of the several soils of the county. The distribution of these soils is shown on the accompanying map by means of colors.

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Dekalb stony silt loam	206,080	35.2	Moshannon silt loam	7,680	1.3
Meigs clay loam	189,568	32.4	Huntington loam	3,008	.5
Dekalb silt loam	75,136	12.8	Holly silty clay loam	1,984	.3
Holston silt loam	13,888	4.7	Riverwash	256	.1
Low-terrace phase	13,504		Huntington fine sandy loam	128	.1
Huntington sandy loam	22,272	3.8	Holston sandy loam	64	.1
Rough stony land	20,736	3.5	Holston fine sandy loam	64	.1
Upshur clay	19,712	3.3			
Huntington silt loam	10,880	1.8	Total	584,960

DEKALB SILT LOAM.

The Dekalb silt loam consists of a gray, grayish-yellow, or pale-yellow silt loam, underlain at an average depth of about 10 inches by a yellow, friable, silty clay loam, which either continues downward through the 3-foot section or passes into a yellow, crumbly, silty clay near its lower limit. In places the subsoil is faintly mottled in the lower part with red or shades of brown. In the poorer drained, flat bodies here and there the surface is more distinctly gray and the subsoil is generally mottled slightly with gray. Occasionally bedrock comes within the 3-foot section. Usually the material directly over the rock is more sandy than that at a greater distance above, which accounts for the sandy character of some of the sloping areas where erosion has removed a portion of the top material, thus bringing the underlying rock nearer the surface. There are some patches on the slopes which really represent Dekalb sandy loam, these not having been mapped on account of their small size and irregular distribution. Small fragments of sandstone frequently occur on the surface and throughout the typical smooth, less sloping portions of the type, while on slopes a good many fragments, some small and some moderately large, are present.

The Dekalb silt loam occurs to a large extent upon the crests of the mountain ridges and is developed principally over the southeastern half of the county. The soil material is derived from shales and sandstones belonging to the Mahoning and Allegheny formations, and the gray phases of the Monongahela and Conemaugh formations. The surface configuration is undulating to gently rolling and sloping. Much of the type is forested with oak, chestnut, and some dogwood, pine, and sourwood.

A considerable proportion of the type is under cultivation to the general farm crops, including wheat, oats, rye, corn, potatoes, timothy, redtop, clover, cowpeas, and soy beans. Owing largely to the fairly even surface, on which reapers can be used, wheat is a crop of

some importance. The yields vary from 10 to 20 bushels per acre, the best results being on portions of the type that have been built up by turning under organic matter. Oats and rye are grown very little. The yields are comparatively low. Corn does only fairly well, the yields rarely exceeding 25 bushels per acre, unless stable manure and heavy applications of nitrogenous fertilizer are used. Cultivated grasses do fairly well, but this soil is not especially adapted to bluegrass. Clovers do not thrive upon this soil as upon those that contain more lime. The type is very well suited to Irish potatoes, and there is an excellent local market for this crop. (Pl. I, fig. 1.) The yields vary from about 100 to 250 bushels per acre. The soil responds well to commercial fertilizers, and in the illustration cited above the rows on the left have been fertilized, those on the right have not.

The Dekalb silt loam is well adapted to the growing of apples, peaches, pears, plums, blackberries, raspberries, strawberries, and other small fruits. The topography and position of the type make it well suited to commercial orcharding, and many good orchards are located upon it.

The following table shows the results of mechanical analyses of samples of the soil and subsoil of the Dekalb silt loam:

Mechanical analyses of Dekalb silt loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
221019	2 miles south of Spring Hill.	Silt loam, 0 to 8 inches..	0.5	1.4	1.0	5.5	13.8	63.8	13.7
221020	Subsoil of 221019.....	Silty clay loam, 8 to 36 inches.	.3	.8	.8	4.1	12.8	60.4	20.9

DEKALB STONY SILT LOAM.

The soil material of the Dekalb stony silt loam is essentially identical with that of the Dekalb silt loam, but there is a wide difference in topography, as well as in the quantity of rock fragments present. The fine material consists generally of a gray, pale-yellow or dark-gray silt loam, underlain at variable depths, usually at about 8 to 10 inches, by yellow silty clay loam, which in places passes below into yellow silty clay. Bedrock is frequently reached within the 3-foot section. Small and large fragments of sandstone and, to a less extent, of shale are scattered over the surface and disseminated through the soil body in varying quantities. The

type includes areas having the texture of a loam and some even as light as a sandy loam, but these were not mapped on account of their small size, irregular distribution, and inaccessibleness. There are also many patches in which the surface soil is a dark-gray to black mellow loam to a depth of about 3 to 6 inches. The black color of these areas, which occur in the shelf situations upon the gentler slopes and in the mountain-side drainage ways or coves, is due to the presence of a large amount of decomposing vegetable matter derived from the mantle of leaf mold. There are places where a part of the dark color is caused by coal particles from "coal blossoms" and wash from numerous coal seams that outcrop upon the mountain sides of the Allegheny and Pottsville formations. Where fields of this soil have been cleared and put under cultivation, constant cropping for years, even to the point where poor yields are obtained, does not seem to change the color of the soil to any appreciable extent.

The Dekalb stony silt loam characteristically occurs on steep slopes, frequently flanking the high, relatively flat-topped ridges occupied by the Dekalb silt loam. These slopes are generally so steep as to be difficult to climb. The fact that such steep slopes are soil clad rather than bare rock outcrop or rough, rocky land is surprising. There are some included areas of both Rough stony land and Rock outcrop, the last often occurring as sheer rock cliffs, but these could not in all cases be satisfactorily mapped. The heavy tree growth, including chestnut, oak, dogwood, poplar, and spruce pine has assisted in holding the soil in place against erosion.

Most of this type is forested; in fact the greater part of it is suitable for nothing else except pasturage, and some of it is so steep that severe grazing would be followed by ruinous washing. Some of the less sloping portions, such as part of that in the vicinity of Charleston, are used for corn, truck crops, hay, and pasturage. Cultivation of many of the slopes with plows is absolutely out of the question; the land would even be difficult to cultivate by hand.

In the vicinity of Charleston where land values are high and large quantities of stable manure can be secured, the type can be profitably used for the growing of truck crops and sweet corn, provided this work is done largely by hand. The type is fairly well adapted to fruit, but the steepness of the slope precludes commercial orcharding.

The yield of corn is usually very low, averaging around 10 bushels per acre, except on newly-broken land, where it will range from 25 to 30 bushels. The soil is not especially adapted to grasses or clovers. Tobacco can be grown to advantage on the gentler slopes. In general the type is not desirable for farming and probably would be more profitably kept in forest.

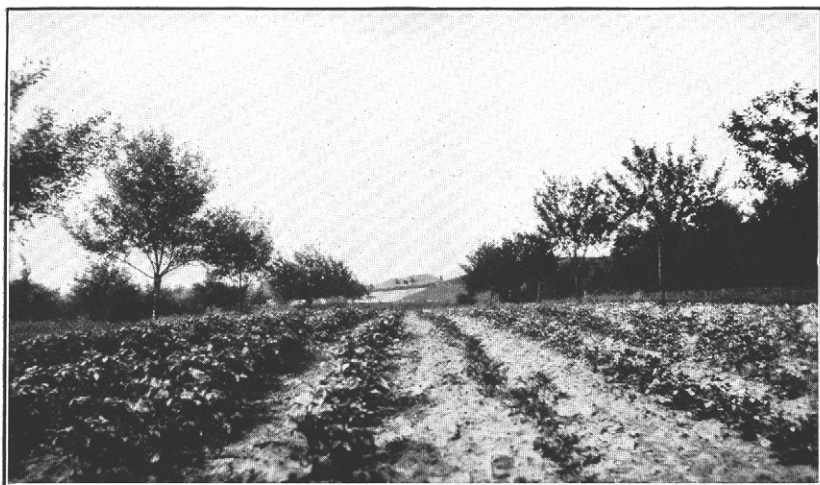


FIG. 1.—POTATOES ON DEKALB SILT LOAM SHELF, SHOWING FERTILIZED AND UNFERTILIZED ROWS.



FIG. 2.—BUCKWHEAT ON HOLSTON SILT LOAM, SHOWING TOPOGRAPHY OF MEIGS CLAY LOAM IN BACKGROUND.

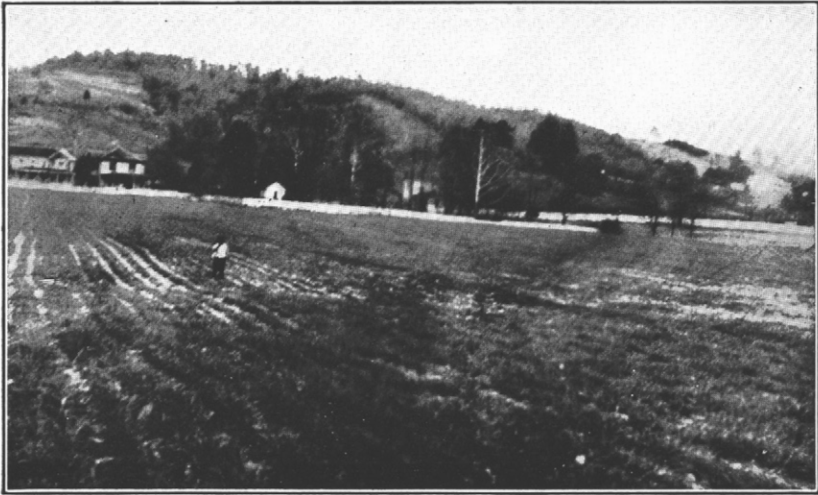


FIG. 1.—RYE AND VETCH ON HOLSTON SILT LOAM, NEAR INSTITUTE. MEIGS CLAY LOAM ON HILLS IN BACKGROUND.

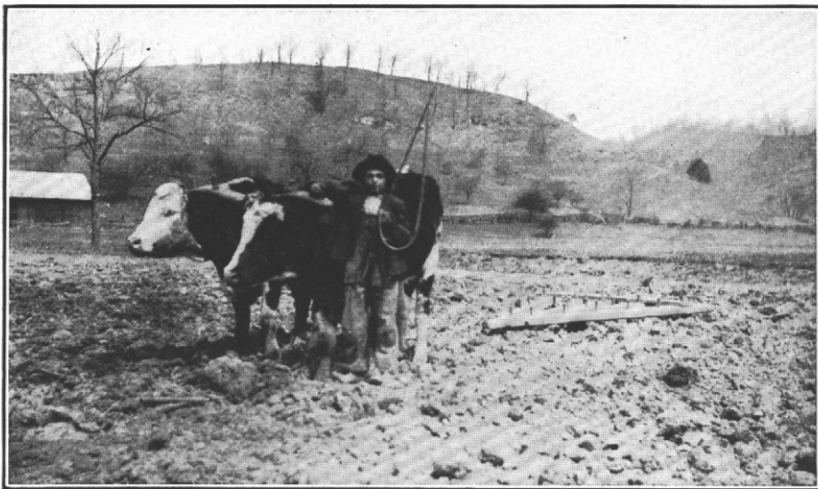


FIG. 2.—SHOWING HOLSTON SILT LOAM, NEAR SISSONVILLE, PLOWED IN WET CONDITION.
TYPICAL TOPOGRAPHY OF MEIGS CLAY LOAM IN BACKGROUND.

UPSHUR CLAY.

The Upshur clay typically consists of an Indian-red, heavy, somewhat plastic clay having a depth of 3 feet or more. There is a thin surface mantle over most of the type varying from a fraction of an inch to 3 or 4 inches in thickness and consisting of dark-brown to reddish-brown or Indian-red silt loam to silty clay loam. Fragments of red and greenish shale and sandstone are present in varying quantities upon the surface and throughout the profile in most of the type. In places lime concretions are found in varying quantities. These are derived from associated fossiliferous limestone or red shaly limestone formations. The most noticeable occurrence is the Ames limestone horizon, which outcrops in the southwestern part of the county and is very conspicuous in the hills south of St. Albans.

In topography the type varies considerably, the surface depending upon the position of outcropping strata of the parent shale rock. Areas are found upon ridge tops, upon benches, and at the base of hills. In general the surface configuration is gently rolling, but there are places where it is comparatively steep. The type is developed over the northwestern part of the county and occurs usually in comparatively small areas. The largest bodies are in the extreme northwestern corner of the county to the north of Pocatalico River. Nearly all of the type is cleared and under cultivation. It is considered the strongest upland soil in the county and is best suited to general farming. It is well adapted to grasses and clover. Bluegrass comes in naturally, and where sown it makes a splendid stand and pastures last indefinitely.

The crops grown are corn, wheat, oats, clover, and timothy. Wheat yields from 12 to 20 bushels per acre. Probably one-half of the wheat grown in the county is upon this type. Corn produces well where the soil has been properly handled, yielding from 25 to 40 bushels per acre. Oats are grown to a very small extent and yield from 20 to 30 bushels per acre. Clover is grown alone upon this soil more than on any other type in the county. It is readily seeded and yields from 1 to 2 tons of hay per acre. Timothy makes a good growth and yields from $1\frac{1}{2}$ to $2\frac{1}{2}$ tons of hay per acre. A mixture of clover and timothy probably gives the best results. Tobacco is grown on a relatively small area. About 1,000 pounds per acre is the average yield where proper fertilization and cultivation are given, but the quality of leaf is not so good as upon the Dekalb soils.

This soil is not especially well adapted to fruits. It can not be recommended as a truck soil, although where the seed bed is properly prepared heavy yields of garden crops can be obtained.

The type originally supported a heavy growth of oak, hickory, walnut, ash, poplar, maple, and beech.

The results of mechanical analyses of samples of the soil and subsoil of this type are given in the following table:

Mechanical analyses of Upshur clay.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
221017	2 miles north of Spring Hill.	Brown clay, 0 to 3 inches.	0.0	1.4	1.1	3.2	4.0	58.8	31.3
221018	Subsoil of 221017.....	Red clay, 3 to 36 inches.	.0	.0	.3	.9	2.0	39.4	57.0

MEIGS CLAY LOAM.

The Meigs clay loam consists of undifferentiated Dekalb and Upshur material resulting from the weathering of comparatively thin strata of sandstone and red shale with occasional beds of gray shale and fossiliferous limestone. The sandstone and gray shales weather into Dekalb silt loam, and the red shales mainly into Upshur clay. There is present gradational material between the Upshur and Dekalb, as upon the steep hillsides where mixing of material derived from the different rocks is caused by landslides and surface wash. Such Upshur-Dekalb soil is gray to reddish gray upon the surface and varies from silt loam to silty clay loam in texture. The soil varies from 2 to 8 inches in depth. The subsoil is a yellow to reddish-yellow silty clay loam, grading at about 2 feet into a dull-red or mottled Indian-red and yellow clay.

The prevailing color characteristics of the Meigs clay loam are gray and yellow in the soil and red or yellowish red in the subsoil. Scattered upon the surface and also through the entire soil profile is found a considerable quantity of small shale and sandstone fragments, but not enough to give the soil a gravelly character, except locally. In many places a mass of rock fragments or the parent rock is encountered at 24 to 36 inches, but over the greater proportion of the land the soil material is 3 feet or more deep.

The proportion of Upshur to Dekalb material varies considerably in different places. The Upshur is dominant in the northwestern part of the county and the Dekalb becomes more pronounced toward the eastern boundary of the type where the red shale formation begins to thin and finally disappears before the southern part of the county is reached. The proportions of the Upshur and Dekalb soils composing the Meigs type vary in different places according to the predominance of the shale or sandstone parent rock.

The Meigs clay loam is confined almost entirely to the northwestern half of the county. It is one of the most extensively developed soils in the area.

Over most of its area, the topography of the Meigs clay loam is steep. (Pl. I, fig. 2, Pl. II, figs. 1 and 2.) In some places the ridges broaden out, the hills are more rounded, and the slopes are more gentle. Benches, or "shoulders," are of frequent occurrence on the slopes, owing to uneven weathering of the hard sandstone and soft shale. Such benches are nearly level. On the whole the drainage of this soil is excessive and during dry spells crops often suffer for lack of moisture.

On account of the large proportion of included heavy Upshur material cultivation is difficult over much of the Meigs clay loam area, and plowing must be done when the soil is only moderately moist in order to avoid clodding.

The principal crops grown are corn, wheat, tobacco, and hay. Corn yields from 15 to 35 bushels, with an average of 25 bushels per acre, and wheat from 10 to 20 bushels per acre. The best yields are obtained usually upon ridge tops or where the soil is predominantly Upshur. For wheat 250 to 300 pounds of acid phosphate are used upon this type, a little heavier application being made when grass is to follow the wheat. Tobacco is not grown as extensively on the Meigs clay loam as in adjoining areas, but produces from 1,000 to 1,200 pounds per acre. It is generally grown on new land, and when old land is used heavy applications of fertilizer are made. Grass does well, and much of the land is in permanent bluegrass pastures. The grazing capacity of the land in general is placed at about 1 steer per acre and slightly higher where the Upshur clay is dominant. Timothy and redtop are grown for hay and yield about 1 to 1½ tons per acre, but the surface is usually too steep for the use of mowers, so that hay production is not carried on extensively. A good stand of bluegrass well cared for will last for 15 to 20 years without reseeding, and if judiciously grazed and limed the life of sod can be prolonged indefinitely. The Upshur material is fairly well adapted to clover.

A large number of beef cattle and some sheep are kept. Where the land is located near Charleston and large quantities of stable manure can be obtained, truck crops can be grown to advantage.

Fruits do well, especially upon the Dekalb material. A few good orchards were seen. These were producing an abundance of fruit of excellent quality. Apples, peaches, plums, and cherries were found flourishing in small orchards.

Most of the Meigs clay loam is cleared and in pasture or in cultivated crops. The natural forest growth consists largely of oak, chestnut, chestnut oak, hickory, walnut, and locust.

The prices of land composed of Meigs clay loam vary from \$15 to \$50 an acre.

ROUGH STONY LAND.

The Rough stony land includes areas so steep or so covered with rocks, or both, that it is impossible to cultivate them. A few areas of Rock outcrop too small to separate have been mapped along with this type. The topography is usually very steep, the land occurring for the most part along the valley walls of the larger streams. The soil material is for the most part similar to that of the Dekalb silt loam, although there are included areas having the texture of the clay loam member of this series.

Rough stony land is of little or no agricultural value. Portions of it can be grazed, but by far the greater part can be best utilized for forestry. The natural tree growth consists largely of oak, spruce pine, and hemlock.

HOLSTON SILT LOAM.

The surface soil of the Holston silt loam is a brown to yellowish-brown, mellow, silt loam about 10 inches deep. The subsoil is a yellowish-brown, friable, heavy silt loam to silty clay loam, becoming more compact with depth.

The material of which this soil is formed is old alluvium washed from the various upland soils of the region, mainly those derived from sandstone and shale. The type occurs as high second bottoms, stream terraces, or old abandoned stream channels. It stands several hundred feet above the first bottoms of associated streams. The most prominent area is found in what is known as the "Flatwoods," a section of the county lying northeast of St. Albans near the Putnam County line. The "Flatwoods" seems to have the general elevation and other features characterizing Teays Valley. The type is also found in detached areas in other parts of the county. The old alluvial deposits have suffered considerably by erosion and the remnants represented by the Holston silt loam form only a small proportion of their original area. The deposits are scarcely ever deeper than 25 to 30 feet.

The crops grown on the Holston silt loam are wheat, oats, corn, timothy, clover, tobacco, and potatoes, and other vegetables. Buckwheat is occasionally grown as a catch crop. Plate I, figure 2, shows a good stand of this crop. Wheat yields from 15 to 25 bushels, oats from 20 to 30 bushels, corn from 20 to 25 bushels, and timothy about 1½ tons per acre. Clover does fairly well, but is not so well adapted to the type as cowpeas, soy beans, or vetch. (Pl. II, fig. 1.) Potatoes are grown on a small acreage, the yields ranging from 100 to 200 bushels per acre. The soil is especially adapted to this crop, and much better yields can be obtained by modern methods of culture.

While the yields of tobacco upon the Holston silt loam are not quite so heavy as upon the first-bottom soils, averaging about 1,000 pounds per acre, the leaf is of high grade.

As a result of lax methods of cultivation the productiveness on many areas of this soil has declined, but where it has been properly farmed the yields are very satisfactory. It is easily cultivated and can be handled without danger of baking or hardening, even if only small quantities of organic matter are incorporated with it. (Pl. II, fig. 2.)

Holston silt loam, low-terrace phase.—The surface soil of the low-terrace phase of the Holston silt loam is practically identical with the typical soil, except in color, which is slightly darker. The subsoil is about the same in color, but is slightly heavier and more compact than the typical subsoil. The phase is found along the bottoms of the Kanawha River and large tributary streams, where it lies from 50 to 75 feet above stream level, or just above overflow. It represents a terrace of the present streams and is of more recent formation than the soil of Teays Valley. The topography is much more nearly level and the surface has suffered very little from erosion.

The low-terrace phase is a better agricultural soil than the rest of the type, but the generally better yields secured on it are in a measure the result of the better farm practice obtaining in the country along the larger river bottoms than in regions more remote.

Early and late potatoes, cabbage, beans, peas, and tomatoes are truck crops that are grown to advantage on the low-terrace phase of the Holston silt loam.

The phase is situated too low for profitable commercial orcharding, but small fruits do well and should be more extensively grown.

The type in general is practically all cleared and under cultivation. The natural forest growth consists of white oak, elm, poplar, sycamore, and beech, and thus is seen to be more closely related to the bottom land than the upland soils.

Land of this low-terrace phase is valued at \$100 to \$150 an acre, while the prices asked for the rest of the type range from about \$30 to \$75 an acre. The location of the two soils has much to do with this wide difference in value.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the typical Holston silt loam:

Mechanical analyses of Holston silt loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
221033	0.5 mile south of St. Albans.	Silt loam, 0 to 8 inches . . .	0.0	1.8	1.4	5.4	19.8	55.4	16.3
221034	Subsoil of 221033	Heavy silt loam, 8 to 36 inches.	.5	1.6	1.1	6.5	21.3	48.2	20.7

HOLSTON SANDY LOAM.

The Holston sandy loam is developed to a very small extent, occurring only at one place, near Spring Hill, in an area large enough to map. Smaller areas are scattered through the Holston silt loam. The type consists of a brown sandy loam, underlain at 8 to 10 inches by pale-yellow loamy sand or sandy loam, which at about 2 feet grades into yellowish-brown or reddish-yellow sandy loam to sandy clay. A considerable number of cobbles and small bowlders are found in the lower part of the sandier areas.

The type at the present time is used for pasture, and for corn and garden crops. It does not furnish very good grazing, as broom sedge seems to be the dominant growth in abandoned fields. The type is well adapted to vegetables and could be used advantageously for early truck crops, such as radishes, kale, beets, lettuce, etc. Melons and cucumbers do well and could be grown profitably, as could also Irish and sweet potatoes. It is also well adapted to cowpeas, soy beans, and vetch.

While the Holston sandy loam is not quite so productive as the Holston silt loam, it is better adapted to early truck crops, and for that reason, being situated near the important local market at Charleston, should be more valuable.

HOLSTON FINE SANDY LOAM.

The Holston fine sandy loam consists of a brown loamy fine sand to fine sandy loam, underlain at about 10 to 12 inches by a yellowish-brown, friable, light, fine sandy loam or loamy fine sand, only slightly compact even in the deeper subsoil. The type occupies very slight elevations in the Holston silt loam, low-terrace phase, near Institute.

The soil has about the same agricultural value as the Holston silt loam, with the exception that it is easier to work and better adapted to early vegetables and melons. At the present time it is utilized for general farm crops. Peas, soy beans, and vetch do exceptionally well. The soil is adapted to about the same crops as the Holston sandy loam, but is slightly more productive.

HOLLY SILTY CLAY LOAM.

The Holly silty clay loam consists of a gray or drab heavy silt loam to silty clay loam, friable and slightly compact, underlain at about 8 to 10 inches by a mottled gray or drab, yellow, and in some places reddish-brown silty clay. The subsoil is moderately plastic and has a greasy feel, owing to the presence of fine particles of mica. In places the immediate surface portion is of a brownish color and in other low, poorly drained spots where organic matter has collected the surface for a few inches is black, but the subsoil is always light colored and mottled.

This type is confined almost entirely to the Kanawha River bottoms and occupies poorly drained depressions and swales, which, in part at least, are subject to overflow. The compact, intractable structure of the subsoil is one factor impairing the drainage. This soil is known locally as "crawfish land" and in nearly all cases shows an acid reaction.

This soil can not be plowed while in a wet condition, as clodding results. Heavy rollers are required to pulverize the soil when clods have been formed. Upon drying out the soil bakes hard and deep cracks form in the surface.

In its present condition the Holly silty clay loam is best adapted to pasturage and the production of hay. When drained and properly handled fair to good yields of nearly all the crops grown in the county may be secured. Hay yields from 1 to 1½ tons per acre.

The original forest growth of beech, sycamore, willow, and elm has been cleared away and most of the type is in pasture.

The results of mechanical analyses of samples of the soil and subsoil of the Holly silty clay loam are given in the following table:

Mechanical analyses of Holly silty clay loam.

No.	Locality.	Description.	Fine gravel.		Coarse sand.	Medium sand.	Fine sand.		Very fine sand.	Silt.	Clay.
			P. ct.	P. ct.			P. ct.	P. ct.			
221005	Dunbar	Silt loam, 0 to 10 inches.	0.3	2.1	1.5	3.2	14.3	55.6	22.6		
221006	Subsoil of 221005	Silty clay loam, 10 to 36 inches.	.0	1.9	1.4	2.6	13.6	56.1	24.3		
221009	1 mile east of St. Albans.	Silt loam, 0 to 8 inches..	.2	1.2	3.0	5.6	9.8	49.6	30.7		
221010	Subsoil of 221009	Silty clay loam, 8 to 36 inches.	.2	1.4	3.0	5.0	8.5	46.5	35.6		

HUNTINGTON SILT LOAM.

The Huntington silt loam is a mellow, brown silt loam, underlain at varying depths, usually about 12 inches, by somewhat lighter colored, friable silt loam. The texture varies somewhat in both the surface and subsoil portions, but is generally that of a typical silt loam. Sandstone and shale fragments are common in the narrow bottoms, especially near the heads of streams and at the junction of streams entering the river from the adjacent uplands. The type as developed along the Kanawha River is dark brown in color and contains very few, if any, rock fragments. Here, also, it occurs in comparatively large bodies and represents the best development of the type.

The material is derived from wash from the upland soils of the drainage basins of the streams along which the type occurs, chiefly

from Meigs clay loam areas in which Dekalb material predominates, but also from Dekalb types.

The Huntington silt loam is a productive type and is so recognized by the farmers of the county. The leading crops are corn, wheat, oats, sorghum, clover, timothy, and potatoes and other vegetables. Of these the soil is probably best adapted to corn, and a large area is devoted to this crop each year. The yields range from 50 to 70 bushels per acre without the use of fertilizer, stable manure, or green manuring crops. The constant enrichment of the soil by sediments laid down by floods makes such yields possible without artificial fertilization. Wheat, oats, and clover are usually grown upon the higher portions of the bottom that are subject to only occasional overflow. The yields of both wheat and oats are good, but there is a tendency for such crops to lodge, and much loss may be sustained in this way, especially if hard wind storms immediately precede harvest. Timothy does exceptionally well, and heavy cuttings are obtained from fields of this grass, the yield ranging from 2 to 2½ tons of hay per acre. Cowpeas, vetch, alsike clover, redtop, and tall meadow oat grass do well, but are grown to a very small extent. A large proportion of the sorghum produced in the county is grown upon this type, the ordinary yield of sirup being from 40 to 60 gallons per acre. The lower portions of the bottoms are well suited to grasses and much of the type is used for grazing, as it furnishes good pasture when the hill pastures are suffering from drought.

In general the Huntington silt loam, like other bottom-land soils, is too low for the profitable production of orchard fruits. Heavy yields of a fairly good grade of Burley tobacco are secured, the average being about 1,200 pounds per acre. This is produced usually with the application of relatively small quantities of commercial fertilizer or manure.

The type is subject to spring overflow, and if cultivated while too wet serious clodding results. Little of this type is in an acid condition.

Nearly all the Huntington silt loam is cleared and under cultivation. The original forest growth consists mainly of sycamore, elm, birch, beech, willow, and gum.

The price of the Huntington silt loam ranges from \$50 to \$150 an acre.

HUNTINGTON LOAM.

The Huntington loam, as typically developed, is a dark-brown, mellow, light loam, underlain at about 15 inches by a friable brown loam, only slightly compact. In places, usually immediately along the river bank, the texture is nearly that of a fine sandy loam. Back from the river it is considerably heavier, approaching a silt loam.

Much of this soil, like the Huntington fine sandy loam, lies either above overflow or above all floods except those of exceptional severity. A considerable proportion forms the front lands of the Kanawha River as a natural levee. The remainder mostly occurs at very nearly the same level, but at some distance from the river banks, from which it is separated by lower land or swales occupied by the Holly silty clay loam. The topography is nearly level to gently sloping or slightly undulating.

Agriculturally the Huntington loam is probably the most valuable soil in the county. The ease with which it can be cultivated, its productiveness, and its wide range in adaptation make it one of the most desirable soils in this section of the country. The crops grown are corn, wheat, oats, timothy, clover, tobacco, sorghum, millet, melons, potatoes, and truck, including nearly all the vegetables suited to the climate of the region. Although the soil is subject to only occasional overflow, very little fertilizer or stable manure is used, except where tobacco or truck crops are to be grown. A crop of clover or rye is occasionally turned under to help maintain the supply of organic matter.

This type is well suited to legumes, such as cowpeas, soy beans, vetch, and alfalfa. The cowpea is the only one of these crops that is planted to any considerable extent. Corn yields from 50 to 60 bushels and tobacco about 1,200 pounds per acre. Wheat, oats, and rye give good returns, but considerable loss is occasioned by lodging.

All of the type is cleared and under cultivation. Birch, beech, elm, sycamore, and willow seem to have been the prevailing forest growth. The price of land is usually high, owing to its location in relation to transportation facilities and markets, ranging from \$100 to \$300 an acre.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Huntington loam:

Mechanical analyses of Huntington loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
221011	1 mile east of St. Albans.	Loam, 0 to 10 inches.....	0.2	0.8	2.2	22.8	25.6	33.0	15.3
221012	Subsoil of 221011.....	Light loam, 10 to 36 inches.	.0	.4	1.6	25.3	27.7	29.0	15.9
221013	1 mile east of St. Albans.	Loam, 0 to 10 inches.....	.0	.4	.5	2.6	13.4	57.6	25.4
221014	Subsoil of 221013.....	Silty clay loam, 10 to 36 inches.	.1	.3	.4	1.6	15.7	49.1	32.9

HUNTINGTON FINE SANDY LOAM.

The Huntington fine sandy loam consists of a brown loamy fine sand, underlain at about 10 to 15 inches by light-brown or yellowish-brown loamy fine sand, which grades below into moderately heavy, friable fine sandy loam.

This type is confined to the rather high bottom of the Kanawha River, where overflows seldom, if ever, occur. It is the best trucking soil in the county and considerable areas are used for that purpose. Turnips, lettuce, onions, radishes, spring kale, potatoes, cabbage, beans, peas, tomatoes, sweet corn, and cantaloupes are the principal crops of this sort. Corn, as a field crop, is grown to a very limited extent. Timothy does only fairly well. About 2 tons per acre of crab-grass hay is cut after the truck crops are gathered.

Practically all the leguminous crops, alfalfa included, should do well upon this type. Wheat, oats, and rye are grown only to a small extent, but make excellent yields when properly fertilized.

The truckers upon this type use rather heavy applications of stable manure, about ten 2-horse wagon loads per acre. Commercial fertilizer is also used; about 600 pounds of an 8-5-8 formula for most vegetables and the same quantity of a 8-6-8 brand for potatoes.

Land of this type ranges in value from \$100 to \$250 an acre.

In the following table are given the results of mechanical analyses of samples of the soil and subsoil of the Huntington fine sandy loam.

Mechanical analyses of Huntington fine sandy loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
221027	1 mile west of Montgomery.	Fine sandy loam, 0 to 15 inches.	0.0	0.5	2.0	42.5	28.4	16.9	9.6
221028	Subsoil of 221027.....	Fine sandy loam, 15 to 36 inches.	.0	.5	4.0	43.9	30.1	12.5	8.9

HUNTINGTON SANDY LOAM.

The surface soil of the Huntington sandy loam is a dark yellowish brown, more or less incoherent, light sandy loam, 10 to 12 inches deep. This grades into a sandy loam of slightly lighter color and slightly heavier texture. In most places considerable sandstone and shale fragments are found scattered upon the surface and throughout the soil section. There are included spots of gravel and also of sand too small to map separately. Some of these are really Riverwash.

The material forming this type is derived from the wash of the Dekalb soils and is developed along the streams in the southeastern

half of the county. The topography is level to undulating. The surface varies considerably in elevation above stream level, but practically all the area of this soil is subject to occasional inundation. At other times the type is usually well drained.

The Huntington sandy loam is a friable, easily cultivated type well suited to the production of early truck crops, sweet and Irish potatoes, melons, sorghum, corn, peas, soy beans, and vetch. Irish potatoes yield from 150 to 250 bushels per acre, and sweet potatoes a little more than this.

The results of mechanical analyses of typical samples of the soil and subsoil of the Huntington sandy loam appear in the following table:

Mechanical analyses of Huntington sandy loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
221025	1 mile east of Barlow	Sandy loam, 0 to 10 inches.	<i>P. ct.</i> 0.9	<i>P. ct.</i> 12.2	<i>P. ct.</i> 17.6	<i>P. ct.</i> 29.9	<i>P. ct.</i> 17.1	<i>P. ct.</i> 15.6	<i>P. ct.</i> 6.8
221026	Subsoil of 221025.	Sandy loam, 10 to 36 inches.	.4	12.8	18.6	26.9	16.3	16.4	8.4

MOSHANNON SILT LOAM.

The Moshannon silt loam is a chocolate-brown silt loam, underlain at about 6 to 10 inches by a chocolate-red or Indian-red silty clay loam to silty clay. The subsoil is friable, although it becomes slightly compact in the lower portion. Both soil and subsoil contain a considerable number of sandstone and shale fragments, and in many places beds of this material are encountered at from 30 to 36 inches or more below the surface.

The type is found largely developed along the streams in the north-western corner of the county, in whose drainage basins the red shale formations cover considerable areas.

It occurs as first-bottom overflow land, and the material from which it is derived has been washed from areas of the Upshur clay or of Meigs clay loam in which the Upshur material is dominant. The red color of the alluvial type is caused by the admixture of Upshur material.

The topography is level to gently sloping and the drainage is good over most of the type. The soil is very productive, giving excellent yields of corn, wheat, oats, tobacco, sorghum, potatoes, hay, and clover. Corn yields from 50 to 80 bushels per acre. Wheat and oats have a tendency to lodge but are grown successfully upon the

higher lying areas of the type, 12 to 15 bushels being considered a good yield. A yield of 1 to 2 tons of timothy hay per acre is usually obtained. Grass does well and much of the type is in pasture. Tobacco is grown to a small extent, with an ordinary yield of about 1,000 to 1,200 pounds per acre, usually of a rather strong, thick leaf. Sorghum makes a heavy growth and produces about 75 gallons of sirup per acre.

Nearly all the type is cleared and under cultivation. The native forest growth consisted largely of elm, sycamore, birch, beech, sweet gum, and willow.

Land composed of the Moshannon silt loam is valued at \$50 to \$100 an acre.

RIVERWASH.

Riverwash includes narrow strips of water-rounded cobbles and angular fragments of sandstone, mixed with considerable sandstone and shale gravel and some fine soil material. It occurs along streams, much of it in the rather broad channels of those streams which carry a large volume of water for brief periods during and immediately following heavy downpours. The type is confined to the comparatively narrow, deep valleys in the eastern part of the county where the run-off is very rapid. A few strips of silt loam, gravelly loam, sandy loam, and loam too small to separate are included with the Riverwash. These better patches are used as gardens and have about the same value as the Huntington types of corresponding textures. Aside from these patches the type has little or no agricultural value.

SUMMARY.

Kanawha County lies in the south-central part of West Virginia and has an area of 914 square miles, or 584,960 acres.

It includes a part of the severely dissected portion of the Appalachian Plateau and has in general rough and broken topography.

The Kanawha River receives the entire drainage of the county. A large percentage of the population is engaged in other pursuits than farming, principally in coal mining.

Charleston, the capital of the State, is the largest town and the principal market in the county.

Good transportation facilities, both rail and water, are afforded.

The climate is mild and equable, the temperature rarely rising above 100° F. or falling below zero. The growing season covers a period of 6 months.

Agriculturally the county may be divided into five districts, based upon differences in practices and crops grown, viz, (1) St. Albans district, where tobacco forms the main money crop; (2) Pocatalico district, where stock growing is the leading industry; (3) Charleston

district, where trucking and dairying lead; (4) Putney and Blakeley district, where general agriculture is practiced to a small extent and no one line is largely developed; (5) Cabin Creek-Paint Creek district, where little or no agriculture is practiced.

The general crops grown are corn, wheat, oats, millet, sorghum, cowpeas, potatoes, clover, timothy, and the truck crops.

Large numbers of beef cattle are raised and also a few sheep for mutton. Hogs and poultry are found in all parts of the county, usually in small numbers.

Apples are grown only on a small scale commercially, and other fruits almost exclusively for home consumption.

Labor is scarce and most of the farm work is done by the farmer and his family.

The soils fall into three groups: Residual, or upland soils; terrace, or old alluvial soils; and first bottom, or recent alluvial soils.

Exclusive of Riverwash, 14 soil types and 1 phase were mapped. They range from sandy loam to clay in texture.

The rocks giving residual soils belong to the Carboniferous period. They are mainly shales and sandstones.

The Dekalb silt loam, with gray soil and yellow subsoil, is more extensively developed in Kanawha County than in any other part of West Virginia so far surveyed. It is used for general farming, trucking, and fruit growing.

The Dekalb stony silt loam has a steep, broken topography and is unfit for extensive agricultural development.

Rough stony land is developed to a limited extent, considering the rough character of much of the country. It is essentially non-agricultural.

The Upshur clay is developed in the western part of the county. It is suited to grazing and to the production of wheat, clover, and timothy.

The Meigs clay loam occupies extensive areas in the northwestern and north-central portions of the county. It is well adapted to grass, and makes good pasture land.

Scattered areas of Holston silt loam occur in this county. It is best suited to the production of tobacco, potatoes, and truck crops. The low-terrace phase is a more productive soil than the typical soil and adapted to a much wider range of crops.

Only small areas of the Holston sandy loam and fine sandy loam are found and they are not important soil types. They are adapted to early, light truck crops.

The Holly silty clay loam usually occurs as high-bottom land along the Kanawha River. It is only occasionally overflowed, but is affected by seepage water during most of the year. Owing to poor drainage, it is a difficult soil to handle, and is best suited to grass.

The Moshannon silt loam is well adapted to corn, tobacco, and grass.

The Huntington silt loam and Huntington loam are dark-brown to yellowish-brown soils. They are best adapted to corn, tobacco, and truck crops. The loam is confined to a narrow strip along the Kanawha River banks.

The Huntington sandy loam and fine sandy loam are the best types in the county for truck growing, and considerable areas of the latter are used for that purpose.



[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the Congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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